Model Q46
Profibus Communications Manual

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PRODUCT WARRANTY

Analytical Technology, Inc. (Manufacturer) warrants to the Customer that if any part(s) of the Manufacturer's equipment proves to be defective in materials or workmanship within the earlier of 18 months of the date of shipment or 12 months of the date of start-up, such defective parts will be repaired or replaced free of charge. Inspection and repairs to products thought to be defective within the warranty period will be completed at the Manufacturer's facilities in Collegeville, PA. Products on which warranty repairs are required shall be shipped freight prepaid to the Manufacturer. The product(s) will be returned freight prepaid and allowed if it is determined by the manufacturer that the part(s) failed due to defective materials or workmanship.

This warranty does not cover consumable items, batteries, or wear items subject to periodic replacement including lamps and fuses.

Gas sensors carry a 12 months from date of shipment warranty and are subject to inspection for evidence of misuse, abuse, alteration, improper storage, or extended exposure to excessive gas concentrations. Should inspection indicate that sensors have failed due to any of the above, the warranty shall not apply.

The Manufacturer assumes no liability for consequential damages of any kind, and the buyer by acceptance of this equipment will assume all liability for the consequences of its use or misuse by the Customer, his employees, or others. A defect within the meaning of this warranty is any part of any piece of a Manufacturer's product which shall, when such part is capable of being renewed, repaired, or replaced, operate to condemn such piece of equipment.

This warranty is in lieu of all other warranties (including without limiting the generality of the foregoing warranties of merchantability and fitness for a particular purpose), guarantees, obligations or liabilities expressed or implied by the Manufacturer or its representatives and by statute or rule of law.

This warranty is void if the Manufacturer's product(s) has been subject to misuse or abuse, or has not been operated or stored in accordance with instructions, or if the serial number has been removed.

Analytical Technology, Inc. makes no other warranty expressed or implied except as stated above.

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Part 1 – Profibus Description

1.1 General

Q46 Analyzers are available with four digital communication options. Profibus-DP, Modbus-RTU, Modbus TCP/IP or Ethernet-IP. This manual applies only to instruments supplied with the Profibus-DP communication option.

1.2 Profibus Communication

Profibus is a manufacturer-independent communication standard, based on EN 510170, that is widely found in applications involving factory automation, building systems controls, and process monitoring. It is a fieldbus standard that allows devices designated as “masters” and “slaves” to communicate with each other and perform independent or combined tasks. Master devices on the network are the devices that maintain control over the entire network, while slaves are devices that report limited information or perhaps control a limited function. Control of the slaves occurs in a cyclic manner. There are three main forms of Profibus: Profibus-DP, Profibus-PA, and Profibus-FMS.

The Q46 is currently a Profibus-DP slave device. Profibus-DP is a high speed data exchange, and is the more generic form of the protocol – including a wide variety of instrumentation and devices.

1.3 Profibus DP Transmission Details

The Profibus communication link consist or two basic parts: the actual communication hardware/bus, and the software scheme that controls what/how information is sent.

The Profibus hardware operates over a proven RS-485 differential network. A very special shielded, twisted 2 conductor, copper cable is used as the bus connection wire. The bus structure allows addition or removal of operating points at any time, without disturbing existing connections. Data transmission speeds of 9.5k to 12M are user selectable, and are generally set based on the environment and application requirements. Each segment must be terminated by an active bus terminating resistor. For the Q46, this termination resistor must be included in the DB9 adapter that connects to the side of the enclosure. On a segment, both bus terminators must always be powered to ensure fault-free operation. Up to 125 devices can be installed on a network.

The Profibus software is a standardized software protocol to which all Profibus users much comply. Profibus DP is typically coded to the level of the software protocol to which the device complies; DPV0, DPV1, or DPV2. DPV0 is the basic form, DPV1 includes some alarm reporting, and DPV2 allows an advanced form of slave-to-slave communication. The Q46 is DPV0, as its alarm functions are coded into its cyclic data. A unique text file, called a GSD file, is used to set the specific information at the master as to what information will be sent over the network from a specific device. This GSD file must be integrated into the master controller on the bus during commissioning of the Q46 on the network.

Q46 monitors equipped with the Profibus option board contain a DB-9 connector on the side of the enclosure. It is the responsibility of the system installer to provide the mating Profibus compliant connector.

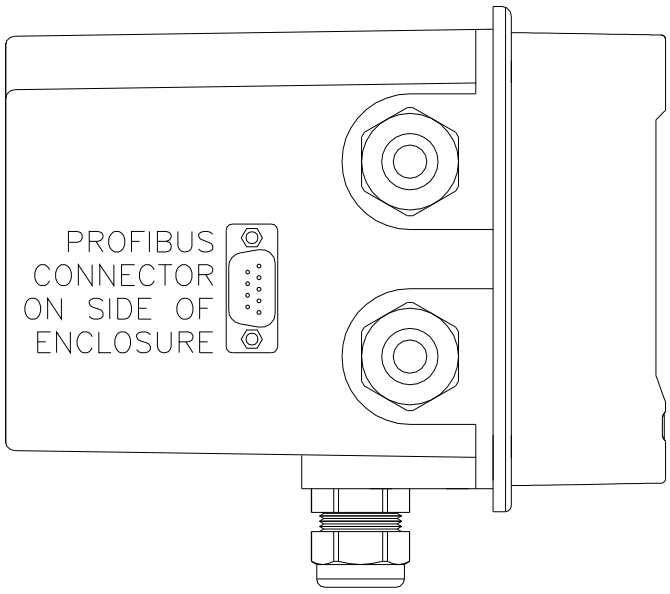

Figure 1 - Profibus Sealed/IP67 Connection

1.4 Profibus Card Installation Instructions

Use the following instructions to install the Profibus Communications Option into an existing Q46 Analyzer. **NOTE: An existing analyzer MUST have the cutout on the side of the enclosure to use this set of instructions**. If you **DO NOT** have the correct rear enclosure, and would like to utilize this communication option, please consult the factory for the correct part numbers needed to use Profibus.

1. Remove the connector cover on the side of the enclosure, by removing the hardware holding the cover in place, and discard.

2. Remove the jack screws from the front of the DB9 connector, and put them aside.

3. Loosen the screws holding the power supply board.

4. Install Profibus PCB first by passing connector into hole in side of enclosure, and then adjusting position of board over the power supply label board until rear header smoothly presses into place. It is necessary to move the Power Supply w/cover to the right of the enclosure while adjusting (with the other hand), and to pull front of DB9 connector high while the rest of the board is low. It helps to line up mounting hole so you can feel where the lower connector is located. Press Profibus board rear edge down firmly once in place.

5. Outside of the enclosure, line up the DB9 holes on the enclosure with the holes in the connector. Using a 3/16" nut driver, install the two jack screws through the enclosure and into the DB9 connector. **DO NOT OVERTIGHTEN**, but make sure they are very snug. Overtightening too much can make them bend out by distorting the plastic case, and they wont connect to the Profibus interface cable. After you have the screws snug, observe the gasket on the PCB inside the enclosure, and make sure it is making a tight seal. If not tighten the jack screws a little more until one is observed.

6. Place the label board over the Profibus board and line up the mounting holes.

7. Install the ¾" screw into the hole next in the PCB next to the marking" Profibus DP".

8. Install the 1-1/8" lg screw into the remaining hole in the cover and secure both.

9. Retighten the screws holding the Power Supply board in the enclosure.

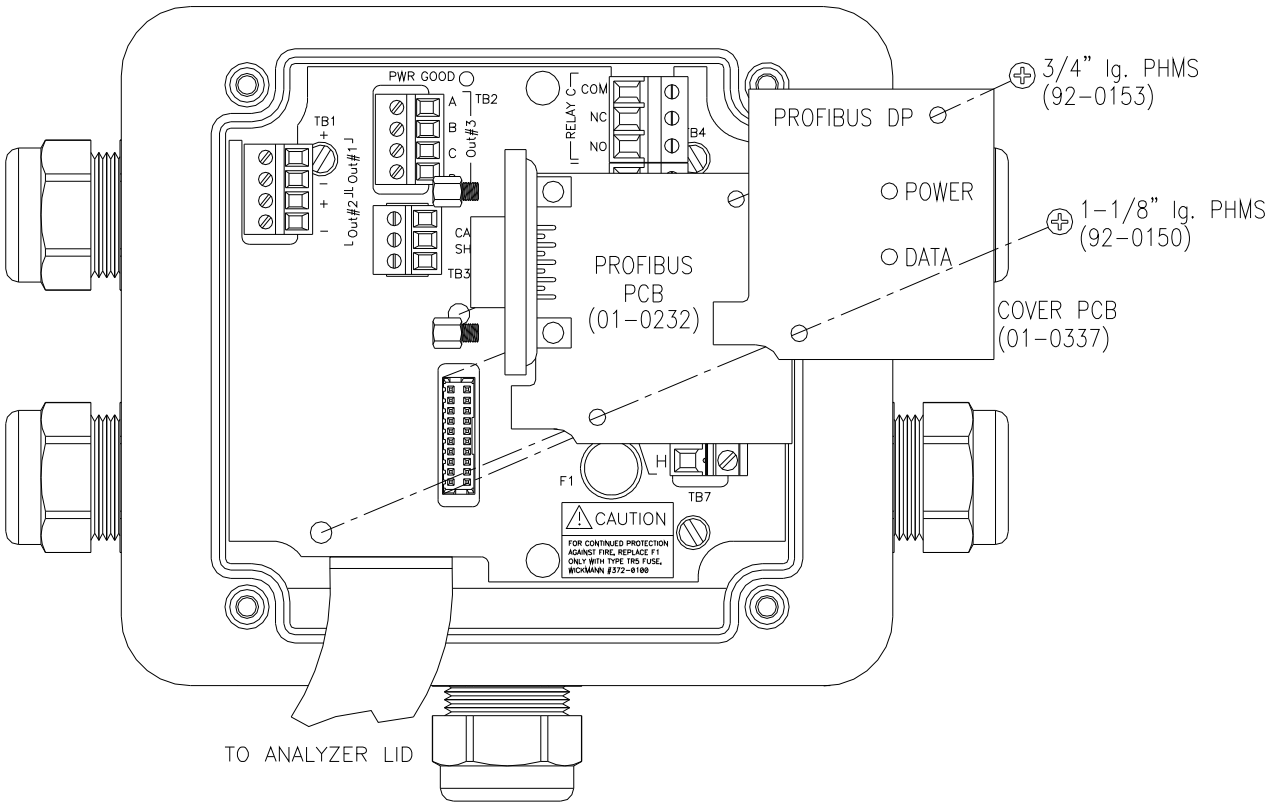

Figure 2 - Profibus Card Installation

1.5 Cable Specification

The cable used for Profibus communication is specifically designed for such a purpose, and ONLY certified Profibus DP cable should be used in the network connections. For the Q46, the cable is terminated inside a special DB9 bulkhead connector that attaches to the side of the Q46 enclosure.

Cable Specification	Value
Impedance	135-165 Ohms
Capacitance	<30 pF/m
Loop resistance	110 Ohms/km
Solid core diameter	0.64 mm
Core cross section	>0.34 mm^2

Figure 3 - Certified Network Cable Specifications

Communication speed can be affected by segment cable length, and the number of repeaters included in a given segment (up to three can typically be used.) Although it might seem desirable to always attempt to run at the maximum 12M bus speed, in reality, users adjust bus speed for maximum network reliability and minimize loss of data. Therefore, the baud rate is often adjusted for the specific environment. A setting of 1.5MHz is the most common starting point. The Q46 supports automatic baud rate selection from the master.

Data Transmission Rate (Hz)	Maximum Segment Length (m)	Maximum Total Network Length (m)
9.6 to 93.76K	1200	4800
187.5K	1000	4000
500K	400	1600
1.5M	200	800
3 to 12M	100	400

Figure 4 - Baud Rate vs. Network Segment Lengths (Typ.)

1.6 The GSD File

The device GSD file is the key that allows all devices on a Profibus network to operate together. This file is a simple ASCII text file that provides device specific information such as the manufacturer name, the device name/ID, hardware/software version, baud rate capability, and number of (or type of) I/O. The GSD file format must conform to Profibus Standard EN 50170.

The universal GSD file can be acquired directly from ATI. Please verify that the GSD file matches the instrument and revision that you are using. The GSD file is uploaded to the network master during the commissioning process to inform the master as to what information will be available from the slave device.

The ATI GSD file for the Q46 instrument family is based on a modular format, so different versions (pH, dissolved oxygen, conductivity, etc.) of Q46 instruments can be grouped together in the same GSD file – greatly simplifying the commissioning process. All Q46 instruments provide 20 bytes of input data to the master, and the meaning of the bytes changes slightly depending on which Q46 instrument is used.

1.7 Raw Data Structure

For parsing on the PLC, the details of the exact bytes for the Q46 are shown in tables in section 1.8. This section presents a closer look at that data on the network. To start, below is the description on how the Q46H chlorine system data is structured. Bytes indexed 1-20 are simply the first to last byte received – 20 total.

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Chorine	Measured Chlorine	1.4920 PPM = 14920
5 to 8	long(32)	Chlorine	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	pH	Measured pH	7.00 pH = 700
13 to 16	long(32)	NA	PID value	17.0% = 170
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	41 = 41

*Note- Long = Long Integer, requires 4 bytes. Char = Character, requires 1 byte

Figure 5 - Q46H GSD File Data Stucture, I/O Format Detail

Running the Q46H as a slave on a ProfiTrace direct connection as the master, we will see the following raw hex data presented on the network. The chlorine measurement in this example is 0.765ppm (2.000ppm range) and the temperature reading is 24.1C -

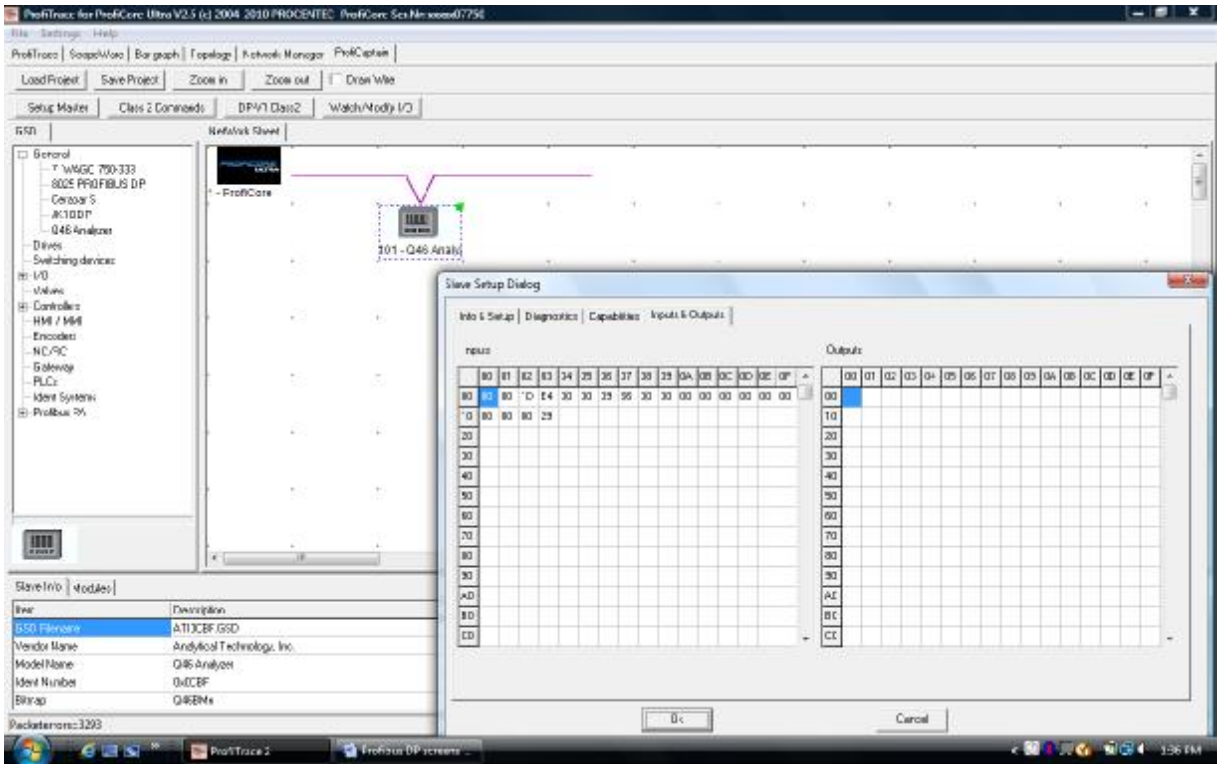

Figure 6 - Q46H ProfiTrace Raw Data Detail

Hex data set parse from the above I/O screen –
0x00, 0x00, 0x1D, 0xE4, =7652 = 0.7652 ppm
0x00, 0x00, 0x09, 0x66, = 2406 = 24.06C
0x00, 0x00, 0x00, 0x00, = 0 (no pH)
0x00, 0x00, 0x00, 0x00, = 0 (no PID)
0x00, = b00000000 = 0, sys status 1, no flags
0x00, = b00000000 = 0, sys status 2, no flags
0x00, = b00000000 = 0, no alarms
0x29 = 41 (fixed instrument ID for Q46H)

Since this is read directly from the ProfiTrace diagnostic tool, there is no byte swapping. It is in its native mode. PLCs may see it the same way, or the values may be byte-swapped in each pair. A macro is present in the GSD for byte swapping, or the user may swap them manually.

In addition, below is a Profitrace sceenshot of the actual datatypes set. Note that "address" is shown starting at address zero in an implied array (20 bytes from address 0 to address 19.) The data bytes shown in the Q46H table is simply listed as the actual first received data byte to the last, or 1-20. So, when parsing in a particular PLC/PC master, be aware that the first data byte showing in the master may start at "address 0."

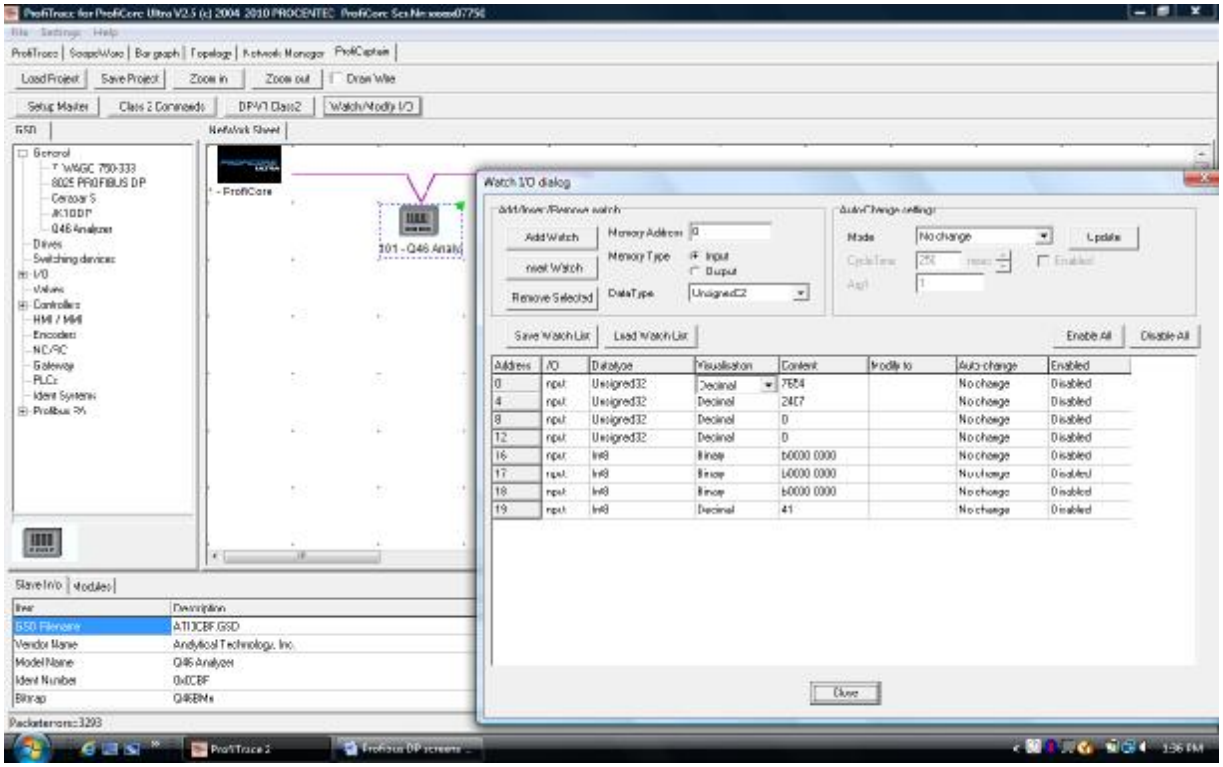

Figure 7 - Q46H ProfiTrace Raw Data Parse

1.8 Commissioning and Start-up, Data Tables

To allow very quick and simple network connections, the Q46 accepts a standard Profibus DP DB-9 adapter on the side of the enclosure. Details involving wiring this connector into the network, and commissioning the instrument are to be done by certified network installers. The details involving full commissioning of the instrument are too specialized and too vast to cover in this document.

Q46H/62, Q45H/63 or Q46H/79PR Residual Chlorine Tables

Q46H/62/63/79PR GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Chlorine	Measured Chlorine	1.4920 PPM = 14920
5 to 8	long(32)	Chlorine	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	pH	Measured pH	7.00 pH = 700
13 to 16	long(32)	Chlorine	PID value	17.0% = 170
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	41 = 41

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46H/62/63 GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	NU
17	1	Cal pH Fail
17	2	Chlor Hi
17	3	Chlor Low
17	4	Temp Hi
17	5	Temp Lo
17	6	pH Hi
17	7	pH Low
18	0	EE Fail
18	1	pH Auto-comp Fail
18	2	LCD Controller Fail
18	3	Cal Chlor Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46H/64 Dissolved Ozone Tables

Q46H/64 GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Ozone	Measured Ozone	1.4920 PPM = 14920
5 to 8	long(32)	Ozone	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	pH	Measured pH	7.00 pH = 700
13 to 16	long(32)	Ozone	PID value	17.0% = 170
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	41 = 41

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46H/64 GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	NU
17	1	Cal pH Fail
17	2	Ozone Hi
17	3	Ozone Low
17	4	Temp Hi
17	5	Temp Lo
17	6	pH Hi
17	7	pH Low
18	0	EE Fail
18	1	NU
18	2	LCD Controller Fail
18	3	Cal Ozone Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46H/65 Dissolved Chlorine Dioxide Tables

Q46H/65 GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Chorine	Measured Chlorine Dioxide	1.4920 PPM = 14920
5 to 8	long(32)	Chlorine	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	pH	Measured pH	7.00 pH = 700
13 to 16	long(32)	Chlorine	PID value	17.0% = 170
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	41 = 41

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46H/65 GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	NU
17	1	Cal pH Fail
17	2	ClO_2 Hi
17	3	ClO_2 Low
17	4	Temp Hi
17	5	Temp Lo
17	6	pH Hi
17	7	pH Low
18	0	EE Fail
18	1	pH Auto-comp Fail
18	2	LCD Controller Fail
18	3	Cal ClO_2 Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46P & Q46R pH and ORP Tables

Q46P or Q46R GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	pH ORP	Measured pH Measured ORP	7.00 pH = 700 -137 mv = -137
5 to 8	long(32)	pH	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	pH	NU	0
13 to 16	long(32)	pH	PID value	47.5% = 475
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	53 (Q46P) 57 (Q46R)

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46P or Q46R GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	mv High
17	1	mv Low
17	2	pH High
17	3	pH Low
17	4	Temp High
17	5	Temp Low
17	6	pH Glass Break – Not Used for ORP
17	7	Reference Fail
18	0	EE Fail
18	1	Checksum Fail
18	2	LCD Controller Fail
18	3	Cal pH or ORP Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46D Dissolved Oxygen Tables

Q46D GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	D.O.	Measured Dissolved Oxygen	8.40 ppm = 840
5 to 8	long(32)	D.O.	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	D.O.	Measured % Saturation	98.0% = 980
13 to 16	long(32)	D.O.	PID value	47.5% = 475
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	49

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46D GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	mv High
17	1	mv Low
17	2	D.O. High
17	3	D.O. Low
17	4	Temp High
17	5	Temp Low
17	6	NU
17	7	NU
18	0	EE Fail
18	1	NU
18	2	LCD Controller Fail
18	3	Cal D.O. Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46N Total and Free Ammonia Tables

Q46N & Q46FN GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Ammonia	Measured Total Ammonia	1.00 PPM = 100
5 to 8	long(32)	Ammonia	Measured Temperature	25.00°C = 2500
9 to 12	long(32)	Monochlor	Measured Monochloramine	0.51 PPM = 51
13 to 16	long(32)	Amm/Mono	Measured Free Ammonia	3.21 PPM = 321
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	45 = 45

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46N & Q46FN GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	NU
17	1	NU
17	2	Ammonia Hi
17	3	Ammonia Low
17	4	Temp Hi
17	5	Temp Lo
17	6	MonoChlor Hi
17	7	MonoChlor Low
18	0	Cal Monochlor Fail
18	1	NU
18	2	LCD Controller Fail
18	3	Cal Ammonia Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46C4 or Q46CT Conductivity Tables

Q46C4 & Q46CT GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Conductivity	Measured Conductivity	2.238 mS = 2238
5 to 8	long(32)	Conductivity	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	Conductivity	*Measured Concentration	1.3 % = 13
13 to 16	long(32)	Conductivity	**Calculated TDS Value	223.5 mg/l = 2235
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	65 (Q46C4) 61 (Q46CT)

* For concentration versions only ** For conductivity versions only
(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46C4 or Q46CT GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	Concentration High
17	1	Concentration Low
17	2	Conductivity High
17	3	Conductivity Low
17	4	Temp Hi
17	5	Temp Lo
17	6	NU
17	7	NU
18	0	EE Fail
18	1	Checksum Fail
18	2	LCD Controller Fail
18	3	Cal Conductivity Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46F Fluoride Tables

Q46F GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Fluor	Measured Fluoride	1.00 PPM = 1000
5 to 8	long(32)	Fluor	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	Fluor	NU	0
13 to 16	long(32)	Fluor	PID value	47.5% = 475
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	73

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46F GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	mv High
17	1	mv Low
17	2	Fluoride High
17	3	Fluoride Low
17	4	Temp High
17	5	Temp Low
17	6	NU
17	7	Reference Fail
18	0	EE Fail
18	1	Checksum Fail
18	2	LCD Controller Fail
18	3	Cal pH or ORP Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU

Q46T Turbidity Tables

Q46T GSD File I/O Format Detail

Byte	Data Type	Sensor	Description	Data Format
1 to 4	long(32)	Turbidity	Measured Turbidity	0.16 NTU = 16
5 to 8	long(32)	Turbidity	Measured Temperature	25.00° C = 2500
9 to 12	long(32)	Turbidity	NU	NU
13 to 16	long(32)	Turbidity	PID value	17.0% = 170
17	Char(8)	NA	System Status 1	(binary) 00000000
18	Char(8)	NA	System Status 2	(binary) 00000000
19	Char(8)	NA	Alarm Status	(binary) 00000000
20	Char(8)	NA	Instrument ID	85 = 85

(Long = Long Integer, requires 4 bytes; Char = Character, requires 1 byte)

Q46T GSD Status/Alarm Bit Detail

Byte	Bitfield	Description
17	0 (lsb)	NU
17	1	NU
17	2	Turbidity High
17	3	Turbidity Low
17	4	Temp High
17	5	Temp Low
17	6	NU
17	7	NU
18	0	EE Fail
18	1	NU
18	2	LCD Controller Fail
18	3	Cal Turbidity Fail
18	4	PID Controller Fail
18	5	Cal TC Fail
18	6	TC Error
18	7	Acknowledge Fail (global)
19	0	Alarm 1, Relay A
19	1	Alarm 2, Relay B
19	2	Alarm 3, Relay C
19	3	Alarm 4, Relay D (optional)
19	4	Alarm 5, Relay E (optional)
19	5	Alarm 6, Relay F (optional)
19	6	NU
19	7	NU